Buckhorn Mountain Project

Mill Site/TDF Plant Survey and Habitat Report

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1 Executive Summary

Crown Resources Corporation proposes to develop an underground gold mine on Buckhorn Mountain in the Myers Creek mining district, Okanogan County, in north-central Washington. An ore milling facility and a tailings disposal facility (TDF) are proposed to be located on private land two miles south of the town of Chesaw. Details of the proposed mill and TDF can be found in the *Initial Plan of Operations, Buckhorn Mountain Project* (2003) prepared by Crown Resources.

In order to facilitate project planning and the permit process, Crown Resources hired Grette Associates to conduct a site survey to collect vegetation information, look for endangered or threatened plant species and investigate whether the site is important or critical habitat for threatened or endangered wildlife species.

A two-tiered plant survey method was employed, the first using vegetation plots along transects and the second, broader survey using walk-through methods. Locations of interest were identified for focused surveys.

A wetlands reconnaissance was conducted to survey for the presence of jurisdictional wetlands. Wildlife habitat features were also identified.

No endangered, threatened or candidate plant species were identified in the surveys. Vegetation was typical of agricultural use in the Okanogan highlands and is common habitat throughout the Okanogan Basin. No wetlands or surface water features were identified. Furthermore, no critical wildlife, habitat or priority habitat types were found on the property.

A plant list, photographs and supporting data sheets are presented in an attached Appendix.

2 Background

Crown Resources Corporation (Crown Resources) proposes to develop an underground gold mine on Buckhorn Mountain in the Myers Creek mining district, Okanogan County, in north-central Washington. Crown proposes to develop the deposit as an underground gold mine on Buckhorn Mt. approximately 3.5 air miles east of Chesaw, with a satellite milling facility two miles south of Chesaw. Most of the project will be developed on private land, with some facility components and access roads on public lands, including lands administered by the U.S. Forest Service (USFS) Okanogan National Forest (Tonasket Ranger District) and the State of Washington.

The milling facility (mill) and a tailings disposal facility (TDF) are proposed to be located on private land two miles south of the town of Chesaw (Figure 1). The mill site is located in the Myers Creek drainage southwest of Buckhorn Mt. Land use on the site had been dominantly livestock grazing. The proposed milling facility consists of an ore stockpile, backfill stockpile, freshwater storage pond, mill, warehouse, shops, and administration building. The TDF consists of a tailings impoundment, reclaim pond, and access roads. Details of the proposed mill and TDF can be found in the *Initial Plan of Operations, Buckhorn Mountain Project* (2003) prepared by Crown Resources.

The mill/TDF site covers approximately 90 acres of rangeland, with small patches of coniferous and mixed forest. Most of the site is relatively flat, and dominated by herbaceous plant species. The forested portions are below the slope break in the Dry Gulch portion of the site. The soils on the site are glacial gravels. In order to facilitate project planning and the permit process, Crown retained Grette Associates to conduct a site survey to collect vegetation information, look for endangered or threatened wildlife and plant species and investigate whether the site is important or critical habitat for threatened or endangered wildlife species. Wildlife habitat features were identified and recorded and a wetlands reconnaissance was conducted.

3 Methods

3.1 Plant Surveys

Surveys were conducted in compliance with *Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed and Candidate Plants* (USFWS 1996). In order to conduct efficient vegetation surveys on the proposed mill and TDF site, a two-tiered survey method was employed. The first survey method was conducted using a 0.25-meter quadrat placed every 100 feet on two transects, each bisecting the herbaceous communities on the south portion of the site (Figure 2). At each quadrat all species present were identified, and approximate ground cover recorded.

The second survey method involved "walk through" surveys where each species was recorded as encountered. This method was employed in the gulch portions of the site, where the vegetative communities were more diverse.

Also, locations of interest were identified where either proposed facility placement or existing site conditions dictated a more focused survey, i.e. a sheltered copse of trees would create microclimatic conditions that could increase plant species diversity in the immediate vicinity. These locations were investigated for species of interest.

3.2 Wetlands and Habitat Reconnaissance

The proposed mill/TDF site has no evidence of past surface water drainage and no previously documented wetlands. In order to verify the presence or absence of wetlands on the site, several locations were examined for wetland vegetation, soils and hydrology characteristics. A wetland field form was completed in these locations, using methods consistent with the 1987 Corps of Engineers Wetlands Delineation methods manual and the Washington State Department of Ecology manual. During these and all field investigations wildlife habitat features, including snags, burrows and nests were identified and recorded.

4 Results

4.1 Plant Surveys

The list of Rare Plants in Okanogan County from the Washington State Department of Natural Resources (DNR) Washington Natural Heritage Program (WNHP) was consulted for state and federal status of rare plants in Okanogan County (WNHP 2003). *Flora of the Pacific Northwest* (Hitchcock and Cronquist 1973) and *Plants of Southern Interior British Columbia* (Parish et. al. 1996) were used to confirm plant species and scientific names.

No State or Federally listed Endangered, Threatened or Candidate plant species were identified. Many of the listed species are associated with wetlands, talus, and native grassland, while the mill/TDF site is upland with both grazing pressure and evidence of timber harvest activities.

4.1.1 Vegetation Survey Results

Twenty plots were surveyed over two transects to identify and characterize the herbaceous plant community that occupies the southern half of the site (Table 1). Eighteen species were identified within the quadrats, though most of the area was dominated by Bluebunch wheatgrass (*Agropyron spicatum*) and Columbia brome (*Bromus vulgaris*) with cheatgrass (*Bromus tectorum*) and redtop (*Agrostris alba*) providing secondary grass coverage. Several other herbaceous species were common, including field pussytoes (*Antennaria microphylla*) and yarrow (*Achillea millefolium*). While these species were found in several plots they did not represent a large portion of any individual plot.

TABLE 1. PLANT SPECIES IDENTIFIED IN TRANSECT SURVEYS.

Transect 1		
Survey Plot	**Species and Common Name**	**Percent Cover***
1	*Agropyron spicatum* - Bluebunch wheatgrass	100
2[1]	*A. spicatum* - Bluebunch wheatgrass	25
	Antennaria neglecta - Field pussytoes	5
	Festuca occidentalis - Western fescue	10
3	*Bryophytes*	40
	A. spicatum - Bluebunch wheatgrass	40
	Agrostis alba - Redtop	10
4	*A. spicatum* - Bluebunch wheatgrass	50
	A. alba - Redtop	5
	Achillea millefolium - Yarrow	10
	A. neglecta - Field pussytoes	15
5	*A. spicatum* - Bluebunch wheatgrass	25
	A. neglecta - Field pussytoes	15
	A. alba - Redtop	15
	Lepidium densiflorum - Prairie pepper-grass	<5
6	*Bromus vulgaris* - Columbia brome	100
7	*Bryophytes*	20
	A. spicatum - Bluebunch wheatgrass	55
8	*A. millefolium* - Yarrow	10
	Thlaspi arvense - Field pennycress	5
	A. spicatum - Bluebunch wheatgrass	15
	A. alba - Redtop	<5
	A. neglecta - Field pussytoes	<5
9	*B. vulgaris* - Columbia brome	40
10	*B. vulgaris* - Columbia brome	50
	A. alba - Redtop	10
11	*B. vulgaris* - Columbia brome	30
	A. millefolium - Yarrow	10
	A. neglecta - Field pussytoes	<5

Transect 1 (Continued)		
Survey Plot	**Species**	**Percent Cover***
12	*B. vulgaris* - Columbia brome	65
	A. neglecta - Field pussytoes	10
	A. millefolium - Yarrow	10
13	*A.spicatum* - Bluebunch wheatgrass	40
	Verbascum thapsis - Great mullien	10
	Agropyron repens - Quackgrass	10
	A. millefolium - Yarrow	10
14	*B. vulgaris* - Columbia brome	65

Transect 2		
Survey Plot	**Species**	**Percent Cover**
1	*A. spicatum* - Bluebunch wheatgrass	60
	A. alba - Redtop	<5
	Solidago spathulata - Spikelet goldenrod	<5
2	*A. spicatum* - Bluebunch wheatgrass	50
	A. repens - Quackgrass	10
3	*A. spicatum* - Bluebunch wheatgrass	25
	Calamagrostis canadensis - Bluejoint	<5
	A. neglecta - Field pussytoes	<5
	Bryophytes	<5
4	*Koeleria macrantha* - Junegrass	10
	A. spicatum - Bluebunch wheatgrass	20
	Campanula rotundifolia - Common harebell	10
5	*Bromus tectorum* - Cheatgrass	30
	K. macrantha - Junegrass	15
6	*B. vulgaris* - Columbia brome	35
	A. millefolium - Yarrow	<5
	Plantago patagonica - Indian wheat	<5

*Percent cover is measured as crown cover, not basal area.

[1] Note cover in each quadrat does not often reach 100 percent. Bare or disturbed ground was common, due to grazing and vegetative density.

4.1.2 Walk Through Survey Results

4.1.2.1 Grazed Patureland

Several herbaceous species were observed during the walk-through survey of the southern site portion that were not represented in the plots themselves (Table 2). These were usually individual plants of species that are present elsewhere in the site, typically in the Dry Gulch.

TABLE 2. PLANT SPECIES OBSERVED IN GRAZED PASTURELAND.

Transect 1	
Centaurea maculosa	Spotted knapweed
Centaurea diffusa	Diffuse knapweed
Cirsium vulgare	Bull thistle
Hypericum perforatum	Common St. John's-wort
Lupinus sericeus	Silky lupine
Pinus ponderosa	Ponderosa pine
Rumex acetosella	Fragile sour weed
Thlaspi arvense	Field pennycress
Tragopogon dubius	Yellow salsify
Transect 2	
Koeleria macrantha	Junegrass
*Stipa spp.**	Needle-and-thread grass
Symphoricarpos albas	Common snowberry

*Due to the conditions in the grazed pastureland, this grass was identified to genus

4.1.2.2 East Side of Dry Gulch

Surveys conducted in the East portion of Dry Gulch were conducted to cover the sideslopes and bottom of the gulch and include forested, shrub and open grassy areas (Figure 2). Grazing is evident over the entire area, as is evidence of past timber harvest (stumps). Coarse woody debris is abundant on the ground, especially in the lowest portion of the gulch. Variations in moisture, aspect, wind and solar exposure and soils within this survey area can be expected to support a diverse vegetative community. Many of the species observed in this area, however, had already been identified during the quadrat surveys and walk through. Additional species observed in this area (Table 3) included non-grass forbes, shrubs and shade tolerant grasses.

TABLE 3. ADDITIONAL PLANT SPECIES OBSERVED IN EAST DRY GULCH SURVEY.

Sisymbrium altissimum	Tall tumble-mustard
Bromus anomalus	Nodding brome
Calamagrostris rubescens	Pinegrass
Poa juncifolia	Alkali bluegrass
Erigonum heracleoides	Parsnip-flowered buckwheat
Arnica chamissonis	Meadow arnica
Aquilegia formosa	Red columbine
Solidago canadensis	Canada goldenrod
Epilobium ciliatum	Purple-leaved willowherb
Rosa woodsii	Prairie rose
Taraxacum officinale	Common dandelion
Fragaria virginiana	Wild strawberry
Galium triflorum	Sweet-scented bedstraw
Galium boreale	Northern bedstraw
Geranium viscosissimum	Sticky geranium
Smilacina stellata	Star-flowered false Solomon's-seal
Larix occidentalis	Western larch
Picea engelmannii	Engelmann spruce
Pseudotsuga menziesii	Douglas-fir
Populus tremuloides	Quaking aspen
Mahonia aquifolium	Tall Oregon-grape
Viola canadensis	Canada violet
Potentilla anserina	Silverweed

4.1.2.3 West Side of Dry Gulch

Surveys conducted in the West portion of Dry Gulch were conducted to cover the north and east facing sideslopes and bottom of the gulch. This area includes a small slide on the east-facing slope located approximately where the top of the TDF dam embankment is proposed (Figure 2). The plant community in this area is similar to the East Gulch. Additional species observed in this area (Table 4) included non-grass forbes, shrubs and shade tolerant grasses.

TABLE 4. ADDITIONAL PLANT SPECIES OBSERVED IN WEST DRY GULCH SURVEY.

Antennaria microphylla	Red pussytoes
Trifolium repens	White clover
Grindelia squarrosa	Curly-cup Gumweed
Bromus briziformis	Rattlesnake brome
Castilleja hispida	Harsh indian paintbrush
Cynoglossum officinale	Common hound's-tongue
Phleum pratense	Timothy

4.1.3 Focused Survey Results

4.1.3.1 *Settling Basin Area*

A survey was conducted in the small draw on the northeast corner of the site where a settling basin is proposed in the *Initial Plan of Operations* (Crown Resources, 2003). The draw was entered from the south with all species present recorded. This site has a larch, Douglas fir and Ponderosa pine canopy with a dense shrub layer of woods rose and snowberry on the habitat edge. Other shrub species and herbaceous plants are scattered in the understory. Species observed in this area that had not been previously observed on the site overall are included in Table 5.

TABLE 5 ADDITIONAL PLANT SPECIES OBSERVED IN SETTLING BASIN AREA

Arnica fulgens	Orange arnica
Aster foliaceus	Leafy aster
Chrysothanmus viscidiflorus	Rabbit-brush
Gilia aggregata	Scarlet gilia
Ribes cereum	Squaw currant

4.1.3.2 Reclaim Pond Area

The reclaim pond area (Figure 2) is located on a perched level area in the northwest corner of the site. Vegetation in the area consists of a canopy dominated by quaking aspen, with scattered Engelmann spruce and Douglas fir, over dense coarse woody debris (primarily downed aspen). The shrubs present are predominantly snowberry, prairie rose, and squaw currant. Only one species was observed here that had not previously been identified on-site, *Erigeron subtrinervis*, the triple-nerved daisy.

4.2 Wetlands Reconnaissance and Wildlife Habitat Observations

The TDF and mill site have been studied for construction feasibility and suitability as a containment facility (Crown Resources, 2003). During the course of these investigations, no wetlands have been identified. Wildlife use of the site is currently limited, due to grazing activities and the resulting compromised wildlife habitat. Some habitat features remain and are discussed below.

4.2.1 Wetlands Reconnaissance

In order to survey for the presence of wetlands, a reconnaissance of the site was conducted, with emphasis on the location of the proposed reclaim pond. The site overall does not exhibit a wetland vegetation community: rather the dominant tree, shrub and herb species are more characteristic of dry or upland site conditions. Plant species throughout most of the United States have been evaluated by the National Wetlands Inventory (U.S. Fish and Wildlife Service) for the likelihood that the presence of a plant community dominated by that species would be a wetland. An “indicator status” is assigned to each species, ranging as illustrated in Table 6.

TABLE 6. USFWS PLANT INDICATOR STATUS CATEGORIES

Plant Indicator Status Category	Indicator Status Abbreviation	Definition (Probability of Occurrence)
Obligate Upland	UPL	Occur rarely in wetlands (less than 1 percent) and almost always in uplands (greater than 99 percent)
Facultative Upland	FACU	Sometimes occur in wetlands (1 to <33 percent) and almost always in uplands (67 to 99 percent)
Facultative	FAC	Equal likelihood in uplands and wetlands (34 to 66 percent)
Facultative Wetland	FACW	Usually occur in wetlands (67 to 99 percent), less likely in uplands (1 to 33 percent)
Obligate Wetland	OBL	Occur rarely in uplands (less than 1 percent) and almost always in wetlands (greater than 99 percent)
Not Listed	NL	Not listed due to insufficient information to determine status

The dominant tree species at the mill/TDF site is ponderosa pine, which has a facultative upland indicator status. The other dominant tree species on the site include Engelmann spruce (FAC), Douglas fir (FACU), western larch (FACU) and quaking aspen (FAC).

The predominant shrub species at the site is snowberry (FACU), followed by tall Oregon grape, which has no indicator status for the Pacific Northwest (NL). The only region where tall Oregon grape has an indicator status is California (FACU).

Herbaceous species that dominate the vegetative community in the quadrat area include Bluebunch wheatgrass (UPL), Columbia brome (UPL) and Cheatgrass (UPL). Other common herbaceous species on-site include spotted knapweed (NL), field pussytoes (NL), bull thistle (FACU), common harebell (FACU) and Common St. John's Wort (NL)

No hydric vegetative communities are present on the site. The only area where facultative vegetation dominates the tree canopy is in the reclaim pond area. In order to confirm the absence of wetlands in that location a wetlands determination was made using the 1997 *Washington State Wetlands Identification and Delineation Manual* (Ecology 1997). This manual is a revised version of the Corps of Engineers Wetlands Delineation Manual (Corps 1987). A vegetation plot was measured, soil pit excavated and a wetlands determination worksheet was completed (Appendix).

It was determined through the state method that the reclaim pond area did not meet any of the parameters for a jurisdictional wetland.

4.2.2 Wildlife Habitat Observations

The mill/TDF site location, as described, is best described as agricultural habitat and interior mixed coniferous forest. Western larch, Douglas fir, Engelmann spruce are all common trees in the northwest interior at these elevations. The grazing disturbance likely prevents natural forest succession from occurring, though some young trees were observed near the slope break at the top of Dry Gulch. Agricultural habitat mixed with forest

patches in areas of topographic relief is common throughout the Okanogan basin, in both Canada and the United States.

A Biological Assessment was prepared for the area of the Crown Jewel mine site and transportation corridor (Cedar Creek 1996) as required under the Endangered Species Act (ESA) of 1973. The BA determined effects for the Gray Wolf, Grizzly Bear, Northern Bald Eagle, and American Peregrine Falcon. This BA determined that the previously proposed project would have no effect on Gray Wolves primarily because no viable populations were in the area. It also found that the area is unsuitable critical habitat for the Grizzly Bear, though some may travel through the area occasionally. No suitable breeding habitat for bald eagles or peregrine falcon was identified in the area.

The Canada lynx (*Lynx canadensis)* is a State and Federal-listed threatened species. Lynx usually live in mature forests with dense undergrowth but can also be found in more open forests, rocky areas or tundra. Lynx den in rough nests under rock ledges, fallen trees or shrubs. Lynx are primarily visual predators but also have well-developed hearing. They hunt mainly at night and snowshoe hare are their primary prey species. According to the *Management Recommendations for Washington's Priority Habitats and Species* (WDW 1991) lynx in Washington favor suitable habitats above 4500ft elevation (1000m). The elevation and habitat of the mill/TDF site are not suitable for either snowshoe hare or lynx.

During the field investigations several wildlife species were either directly observed or detected through sign, primarily bird and small mammal species (Table 7). Three snags were observed on-site, all exhibiting wildlife use by cavity nesters, insectivorous foragers, or both.

TABLE 7. WILDLIFE SPECIES OBSERVED AT TDF AND MILL SITE.

Parus atricapillus	Black-capped Chickadee
Sitta canadensis	Red-breasted Nuthatch
Accipiter cooperii	Cooper's Hawk
Bonasa umbellus	Ruffed Grouse
Colaptes aurateus	Northern flicker
Pica pica	Black-billed magpie
Sphyrapicus Thyroides	Williamson's sapsucker*
Tamias amoenus	Yellow pine chipmunk
Odocoileus hemionus	Mule Deer[1]
Canis latrans	Coyote[2]

*-Detected through characteristic excavations in snags.

1-Carcass observed on-site.

2-Scat, burrow observed. Also evidence on deer carcass.

5 DISCUSSION

The mill/TDF site located outside of Chesaw is a grazed and mixed forest habitat area in agricultural use, typical of the land use throughout the Okanogan highlands. A stratified sampling survey of plant species in the area found a vegetative community of common native and introduced upland vegetation. The species composition on-site is likely skewed by active grazing and past timber harvest activities.

The grassy eastern and southern portions of the site are dominated by grass species common throughout the interior northwest. The Dry Gulch area has scattered forest patches with common mixed conifer and deciduous species characteristic of interior forest.

No Threatened, Endangered or Candidate plant or wildlife species were observed on the site. A wetlands reconnaissance revealed no wetlands were present on the site.

6 REFERENCES CITED

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Appendix A
Wetlands Determination Worksheet

Appendix B

Comprehensive Plant Species List

Latin name	Common name
HERBACEOUS PLANTS	
Achillea millefolium	Yarrow
Agropyron cristatum	Crested wheatgrass
Agropyron repens	Quackgrass
Agropyron spicatum	Bluebunch wheatgrass
Agrostris alba	Redtop
Antennaria microphylla	Red pussytoes
Antennaria neglecta	Field pussytoes
Aquilegia formosa	Red columbine
Arnica chamissonis	Meadow arnica
Arnica fulgens	Orange arnica
Artemesia frigida	Pasture sage
Aster foliaceus	Leafy aster
Bromus anomalus	Nodding brome
Bromus briziformis	Rattlesnake brome
Bromus tectorum	Cheatgrass
Bromus vulgaris	Columbia brome
Calamagrostris canadensis	Bluejoint
Calamagrostris rubescens	Pinegrass
Campanula rotundifolia	Common harebell
Castilleja hispida	Harsh indian paintbrush
Centaurea diffusa	Diffuse knapweed
Centaurea maculosa	Spotted knapweed
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Potentilla anserina	Silverweed
Rumex acetosella	Fragile sour weed

Latin name	Common name
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Smilacina stellata	Star-flowered false Solomon's-seal
Solidago canadensis	Canada goldenrod
Solidago spathulata	Spikelet goldenrod
Stipa comata	Needle-and-thread grass
Stipa richardsonii	Spreading needlegrass
Taraxacum officinale	Common dandelion
Thlaspi arvense	Field pennycress
Trifolium repens	White clover
Tragopogon dubius	Yellow salsify
Verbascum thapsus	Great mullein
Viola canadensis	Canada violet
WOODY PLANTS	
Chrysothamnus viscidiflorus	Green rabbit-brush
Larix occidentalis	Western larch
Mahonia aquifolium	Tall Oregon-grape
Picea engelmannii	Engelmann spruce
Pinus ponderosa	Ponderosa pine
Populus tremuloides	Quaking aspen
Pseudotsuga menziesii	Douglas fir
Ribes cereum	Squaw currant
Rosa woodsii	Prairie rose
Symphoricarpos albas	Common snowberry

Appendix C
Site Photographs

NE from SW corner of site. Typical grazed patureland.

Floor of East Gulch area. Coarse woody debris is both blowdown and slash from timber harvest.

View South from knoll on site. This is typical of the habitat located in the TDF area.

Aspen canopy in reclaim pond area.